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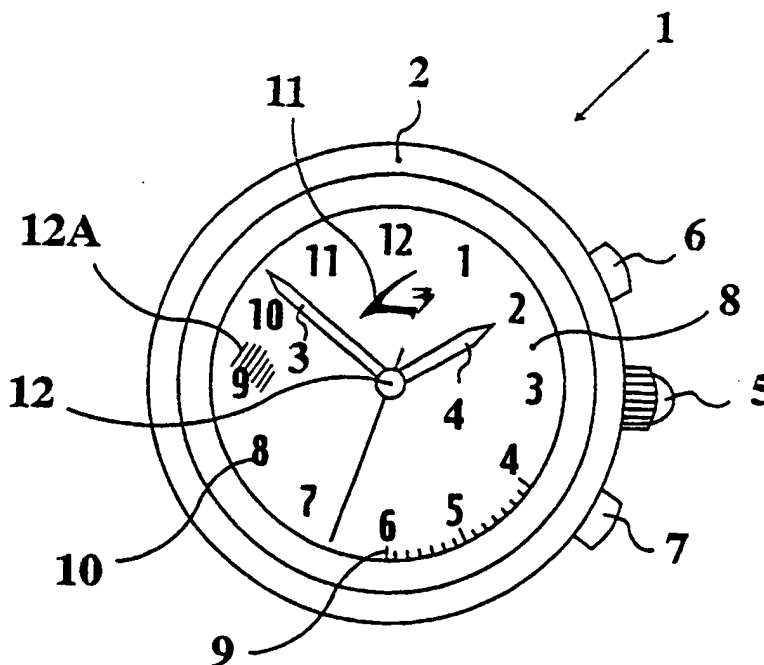
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(54) Title: ILLUMINATING DEVICE FOR WATCHES, GAUGES AND SIMILAR DEVICES

(57) Abstract

A light source is positioned to direct light downward from the cover (12A) of a conventional analog or electro-optical watch, indicator gauge, a meter panel directional gauge or ornamentation display of an image, logo or design or other similar articles (1). These articles are illuminated by the source (12) for viewing in low light or in the dark by an illumination switch (6, 7) to activate said element. The light source (12) is preferably an LED and it is small enough so that when it is off, it is virtually invisible.



ILLUMINATING DEVICE FOR WATCHES, GAUGES AND SIMILAR DEVICES

BACKGROUND OF THE INVENTION

A. Field of the Invention

5 This invention relates generally to an improvement in illuminated devices such as electronic timepieces equipped for a conventional analog or digital display, indicator gauges, which may comprises a meter panel, directional gauges, ornamentation displays of an image, logo or design, and other similar articles which are illuminated for viewing under poor lighting conditions.

10 B. Description of the Prior Art

Historically, watches, gauges and other similar articles were first illuminated by using phosphorescent markings. However, when both the manufacturing methods of phosphorescent materials and the materials themselves proved to be medically and environmentally unacceptable, other
15 illuminating means were developed. Some of these other means include the use of LED, LCD, and fluorescent devices, as well as incandescent bulbs. All of these proved to be unsatisfactory, especially for small devices such as wrist watches.

Additionally, these devices could not provide sufficient illumination due to
20 a non-uniformity in brightness across the illuminated display surface. The

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Another objective of the invention is to provide an improved illumination apparatus for viewing the dial or surface of various objects by positioning an illumination device to direct light in a direction towards the subject to be illuminated which makes viewing easier, more efficient and less stressful to the
5 viewer.

A further objective of this invention is to provide in situations such as limited lighting or at night time, the cosmetic illumination of single or multiple color images, logos or items located on or about the surface of a timepiece, indicator or directional gauges or ornamentation devices.

10 The present invention seeks to attain these objectives by disposing a light-emitting element, on or inside a light transmissive surface of the article to be illuminated. This element is positioned in the center, sides or in a random placement and rendered light emissive or is activated by means of an electronic circuit which is installed within or in proximity of said article. An illumination
15 switch controlled by an external control member is provided on the case of the article for selectively activating the light emitting element.

More particularly, the light source is disposed either on an inner surface of, or is imbedded within the cover or article itself, in such a manner that is virtually invisible to the viewer.

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Fig. 9 is a top view of the illumination pattern for the watch of Figs. 1 and 6;

Fig. 10 shows a cross-sectioned view of a watch illustrating a second embodiment of the invention;

5 **Fig. 11** shows a cross-sectional view of a watch illustrating a third embodiment of the invention;

Fig. 12 shows an enlarged view of the embodiment of Fig. 11;

Fig. 13 shows a cross-sectional view of a watch illustrating a fourth embodiment of the invention;

10 **Fig. 14** shows an enlarged view of the embodiment of Fig. 13; and

Fig. 15 shows a top view of the circuit board for the embodiment of Figures 13 and 14.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figs. 1 and 6 illustrates a top view and a cross sectional view of an
15 analog timepiece such as a wristwatch 1 with a conventional case 2 and with a minute hand 3 and an hour hand 4 mounted on rotatable stems 13 and driven by a conventional movement, the details of which are not material to the present invention and thereafter have been omitted. A button 5 is employed to set the position of the time indicating hands 3 & 4. Push button actuators 6 & 7
20 connected to operate switch contacts (not shown) inside the case of the watch. Actuators 6 and 7 may be used to actuate the subject light source, as well as to provide other optional functions.

Fig. 3 shows a top view of an ornamentation device 201 which could be made from an injection molded transparent thermoplastic acrylic resin having a base 202, a planar or 3D image, or a logo or design 203. The base 202 is covered by a protective body 205. Since the device 201 has no moving parts, 5 the body 205 could envelope the logo or design 203 so that there is no air contained therein. Alternatively, the device 201 maybe have liquid filled body with the logo or design 23 being disposed in the liquid.

Imbedded in solid body 205 there is provided a light source 204 such as an LED. Source 204 can be centrally located as shown. Alternatively several 10 sources (not shown) may be provided for illuminating design 203 all pointing downward toward base 202, and logo 203. A push button actuator 206 could be connected or within proximity to operate switch contacts (not shown) inside or within proximity of the ornamentation device 201.

Each of the sources of Figs. 1, 2 and 3 maybe LED constructed and 15 arranged as shown in Fig. 4 and 5. More particularly, each source includes a substrate 34, a substrate 32 and a substrate 35. These three substrates cooperate to form a standard light emitting diode. Typically substrate 34 may be about 10x10 mils while substrates 32 and 35 may be about 12x12 mils. The bottom surface (as oriented in Fig. 5) of substrate 35 is covered by a metallic 20 layer 36 which forms the cathode for the diode. A portion of a top surface of substrate 34 is covered by a metallic layer 33 which defines the anode for the diode. Layer 33 may be for instance about 4x4 mils. Preferably layers 33 and 36 are made of gold. It should be understood the sources may be made using other types of technology besides LED's as well.

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Superbright orange and red emitters are also available which can generate about 10 mcd at 630 nm with a power consumption of 70 mw.

In one embodiment of the invention, the sources 12, 110, 111, 204, etc. are attached, for example by an adhesive, to the lower or inner surface of the respective protective covers 12A, 103, 205. In an alternate embodiment, instead of joining the source to the surface of the respective cover, the source can be imbedded directly into the cover. For example, as shown in Fig. 10, the timepiece 1 of Figs. 1 and 6 is shown with a source 12C which in this case is imbedded in cover 12A. Wires 37, 38 can be led downward through the stem of the hands as in Fig. 6, or as indicated by the dashed lines, the wires could be arranged either on the bottom surface 12A to extend laterally or radially to the case and then passed through the case to the battery 16 and circuit 15, or they can also be imbedded into cover 12A together with source 12C.

Another embodiment of the invention is shown in Figs. 11 and 12. In this embodiment, a watch 400 is provided with a cover 402, hands 403, 404, dial 405, stem 406, case 407, and an electronic circuit 408. (A separate battery has been omitted for the sake of simplicity). Importantly, watch 400 is further provided with a T-shaped structure 410 having a leg 411, and two arms 412, 413, terminating in light sources 414, 415.

Structure 410 is cast or molded from a transparent, light but strong material such as a polymer. Imbedded in the structure 410 are wires 416 connecting light sources 414, 415 to electronic circuit 408. Preferably, the structure 410 is positioned so that its leg 411 passes through stem 406 and its arms 412, 413 are disposed adjacent to a bottom surface 402A of cover 402 as

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adhesively attached to the inner surface 501A of cover 501. The structures 410, 510 are sized and shaped so that they are virtually invisible.

It should be understood that the light sources can be made into almost any color desirable.

5 Referring now to Fig. 15, circuit board 507 is formed with a central opening 521 and supports various electronic circuits such as 522 and 524 used to drive an analog stepping motor (not shown) operating the hands 502, 503 and/or the light sources 516. The stem 506 passes through the opening 521 and is mechanically coupled to a knob 525 used to position the hands manually
10 when required.

The circuit board 507 is also provided with two arcuate slots 526, 527. Disposed within this slots are respective elastomeric members 530, 532.

Also mounted on circuit board 507 are a plurality of contact pads 534, each pad having two terminals 536, 537. In Fig. 15 four pads are shown for a
15 configuration wherein four corresponding structures 510 are provided. The pads 534 are arranged under each leg 512 of a corresponding structure 510. In this position, each of the wires 518 within the structure 510 comes into electrical contact with one of the terminals 536, 537. At least one of the terminals, such as terminal 536 on pad 534 is connected electrically to one of the corresponding
20 elastomeric members 530, 532. These members 530, 532 are arranged so that when they are pushed radially inwardly (for example by external knobs mounted on case 508 in the usual manner), they establish a contact with terminals 540 or 542, thereby providing a control switch to operate selectively light sources 516 through the circuit 522.

I Claim:

1. An illuminated article comprising:
a surface;
indicia disposed on said surface;
a member extending a predetermined distance from said surface
and being made of a light transmissive material to allow said indicia to be
viewed through said member; and
a light source supported by said member and oriented to direct
light at said indicia to illuminate said indicia.
2. The article of claim 1 further comprising a case, said surface being
incorporated into said case and said member being attached to said case.
3. The article of claim 2 further comprising a power source providing
power to said light source.
4. The article of claim 3 further comprising a control element to
selectively activate said light source.
5. The article of claim 4 wherein said control element comprises a
switch which selectively couples said power source to said light source.

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12. The instrument of claim 10 further including a case holding said dial, a power source disposed in said case and a controller for selectively applying power from said power source to said light source.

13. The instrument of claim 12 further comprising conductors joining said light source to said power source and said controller.

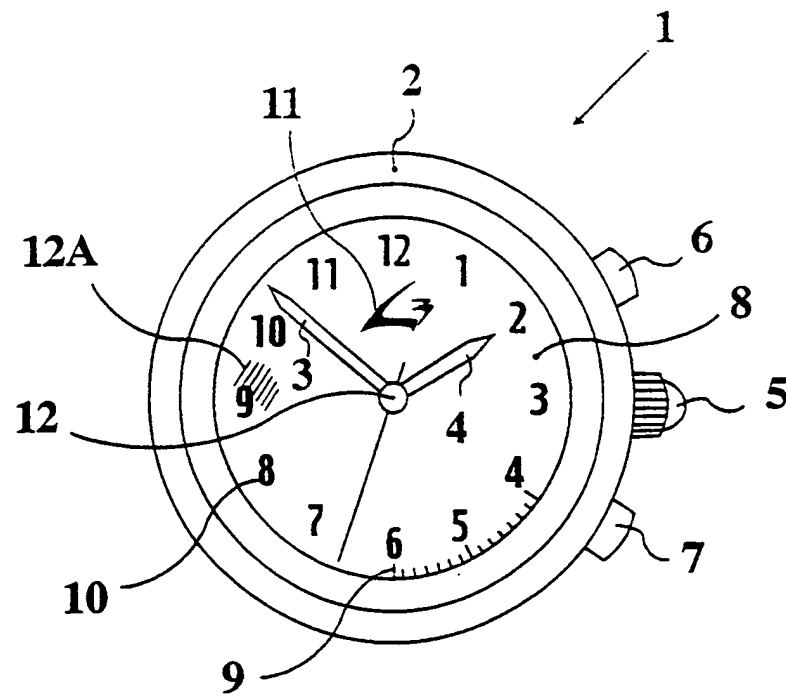
14. The instrument of claim 13 wherein said light source is positioned adjacent to said cover.

15. The instrument of claim 13 wherein said light source is imbedded in said cover.

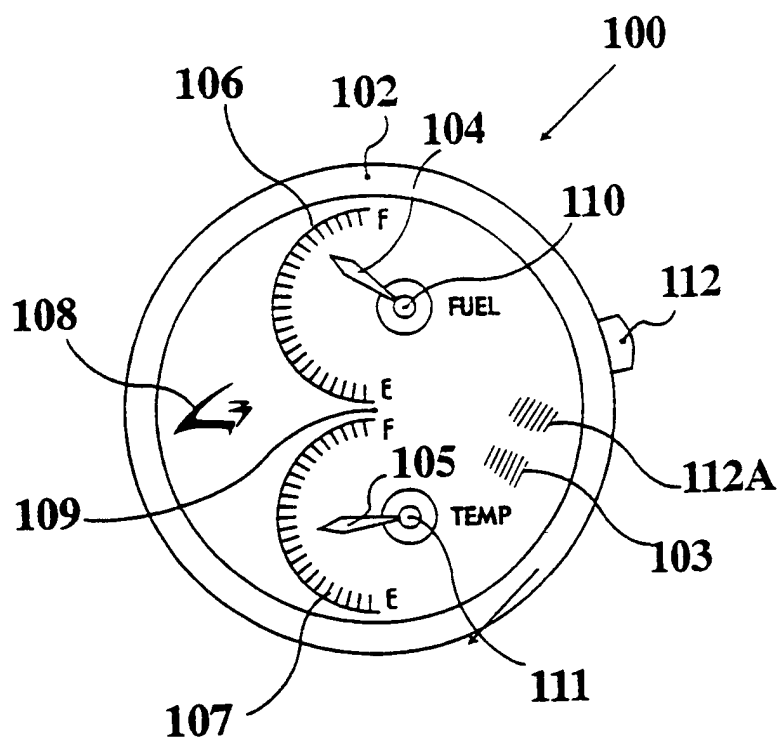
16. The instrument of claim 15 wherein said conductors are imbedded at least partially in said cover.

17. The instrument of claim 13 wherein said dial comprises a stem and wherein said conductors pass through said stem.

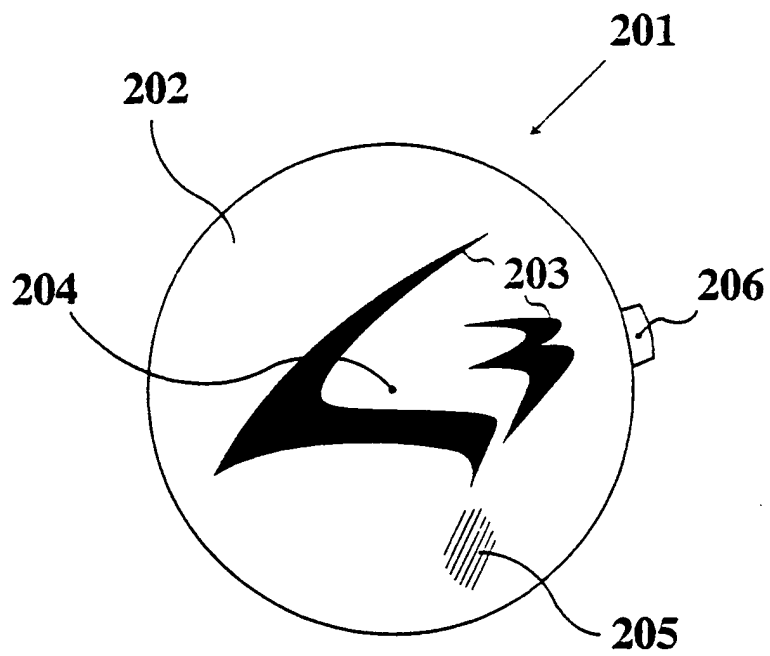
18. The instrument of claim 16 wherein said conductors are arranged along said cover to a point where said cover joins said case.

**FIG. 1**

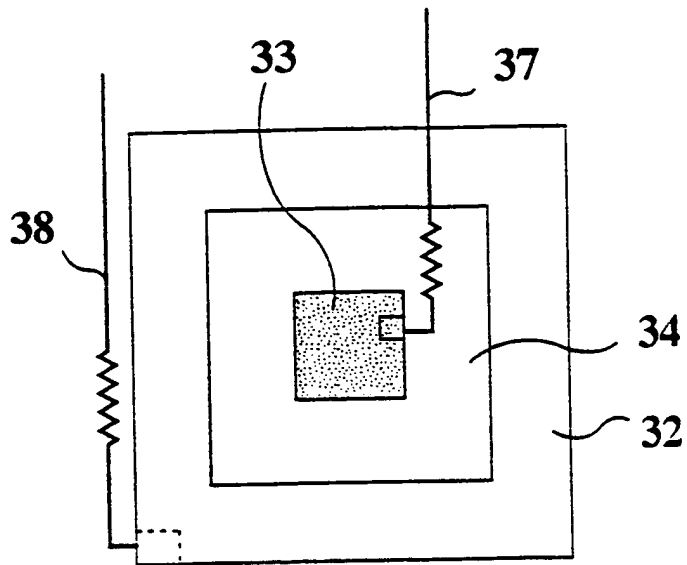
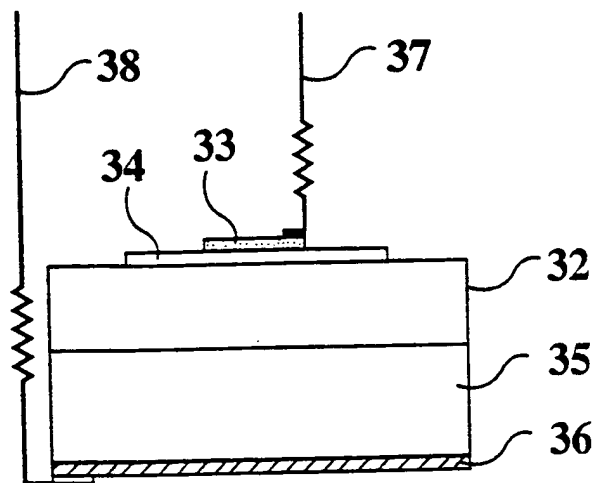
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**FIG. 2**

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**FIG. 3**

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**FIG. 4****FIG. 5**

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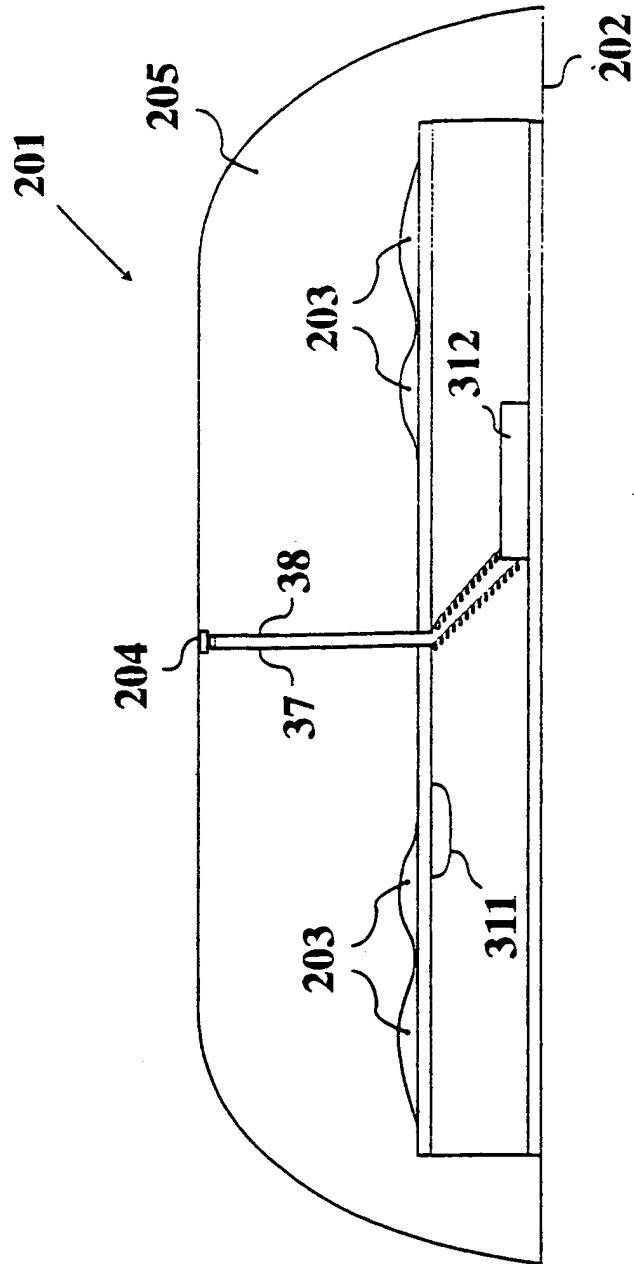


FIG. 7

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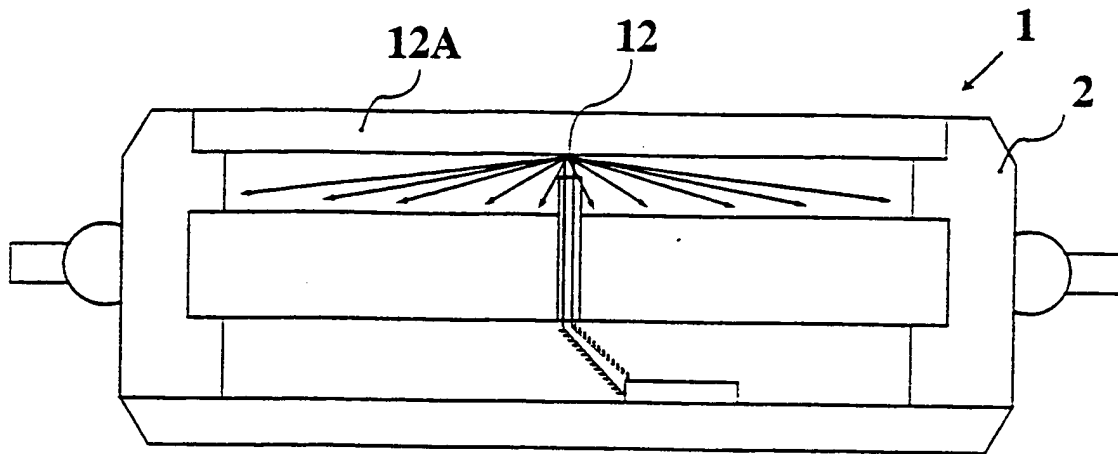


FIG. 8

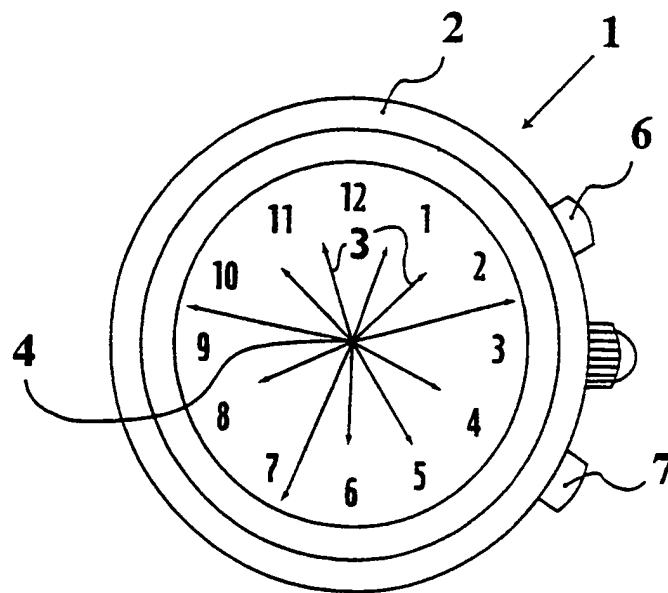


FIG. 9

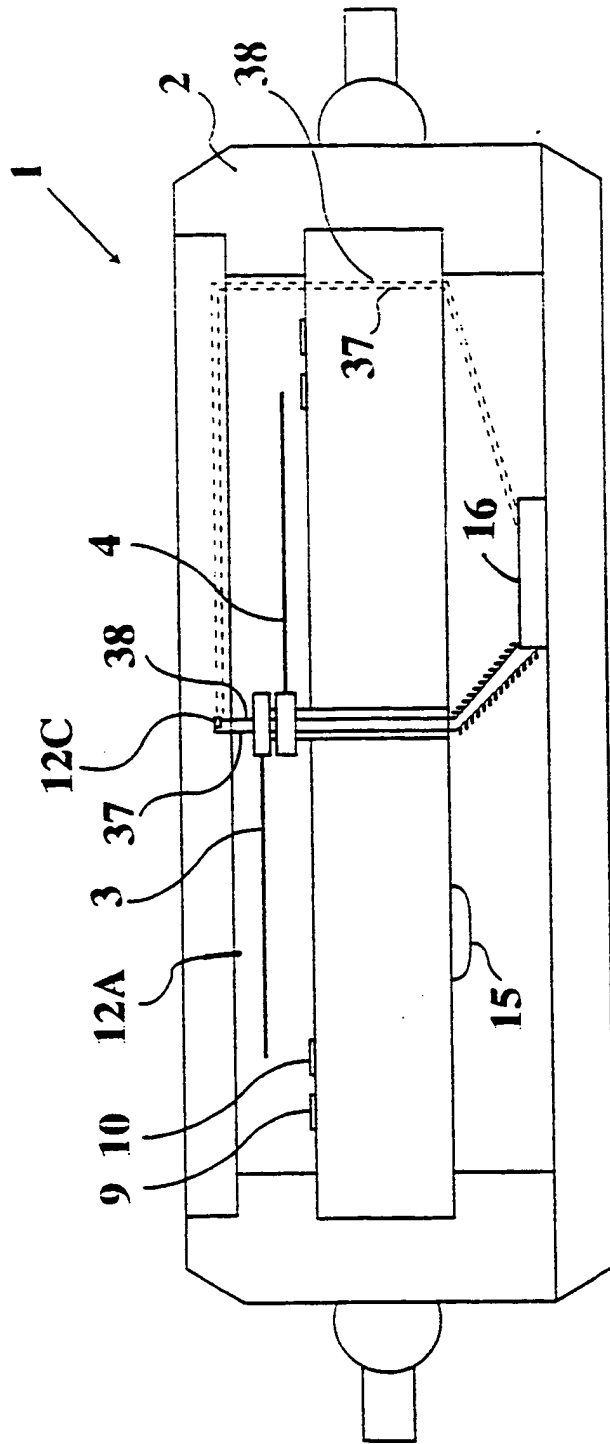


FIG. 10

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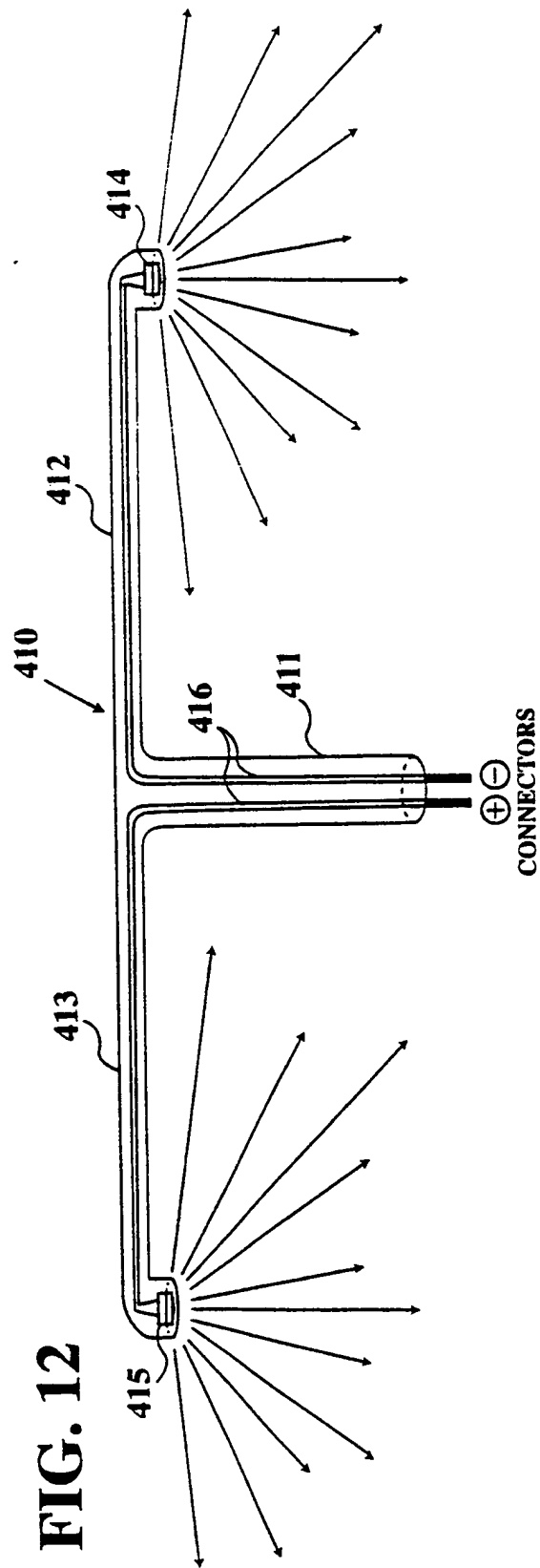
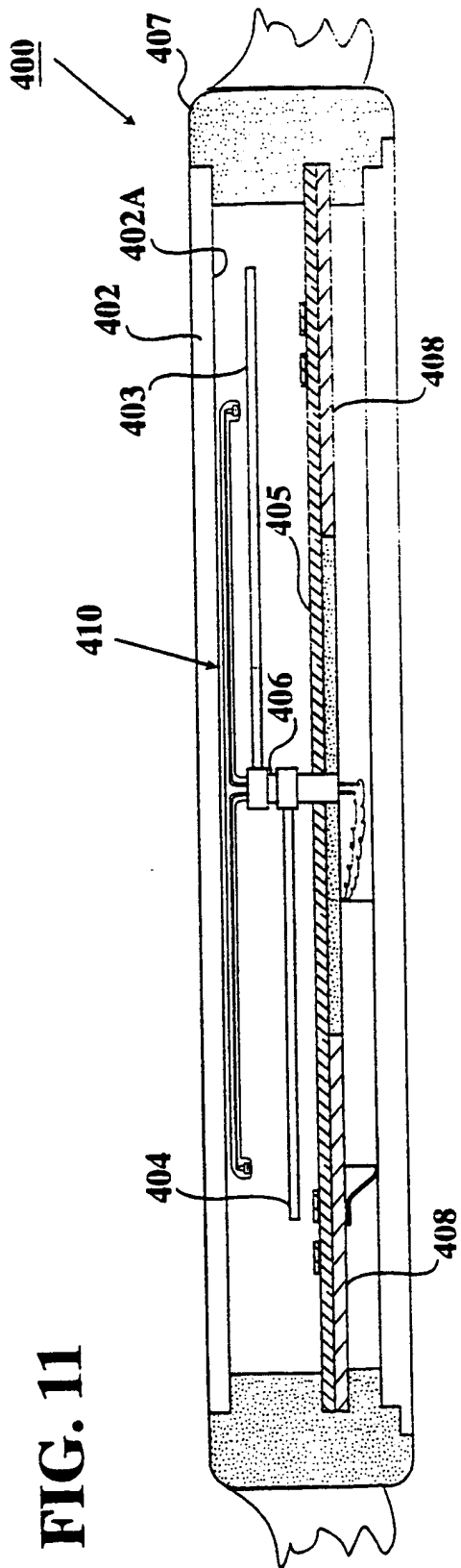


FIG. 13

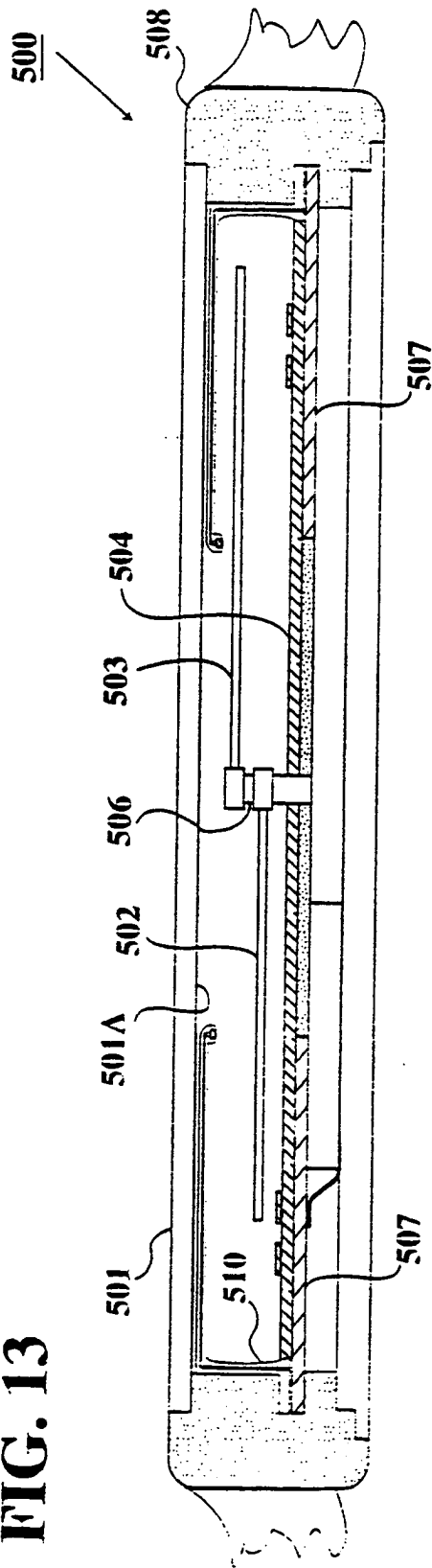
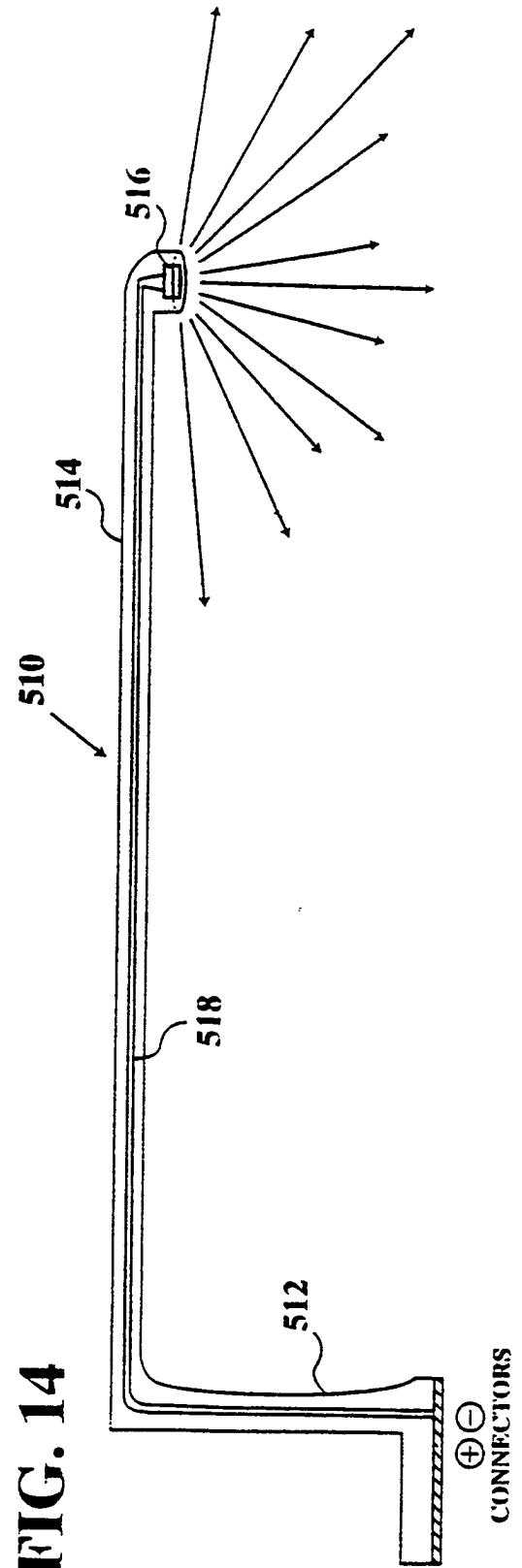


FIG. 14



⊕ ⊖
CONNECTORS

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/06641

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G12B 11/00

US CL : 368/241

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 368/241, 67, 226, 227; 362/23, 26, 27, 28, 29, 551, 559; 116/286, 310, DIG 36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
APS, EAST-BRS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,115,994 A (TOMLINSON) 26 September 1978 (26.09.1978), Figures 1 and 2; column 1, lines 6-11; column 3, lines 20-25	1-16 and 18
A	US 3,754,130 A (STONE et al.) 21 August 1973 (21.08.1973)	17 and 19-23
A	US 4,328,532 A (SMITH) 04 May 1982 (04.05.1982)	17 and 19-23
A	US 4,330,877 A (BARNES) 18 May 1982 (18.05.1982)	17 and 19-23
A	US 5,295,049 A (TERADA) 15 March 1994 (15.03.1994)	17 and 19-23
A	US 5,984,485 A (POLI et al.) 16 November 1999 (16.11.1999)	17 and 19-23

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	
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